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(54) SOUND WAVE SURFACE OPERATED SINGLE TUBE
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THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. In a sound wave surface operated single tube pump for pumping liquid from an underground level to a ground surface:

- (a) a liquid reservoir at said ground surface for containing liquid the same as the liquid to be pumped;
- (b) a sound wave generating device comprising:
 - 1. a cylinder having a bore and a lateral port communicating with said reservoir,
 - 11. a piston reciprocal in said cylinder and moveable into positions opening and closing said port,
 - 111. said piston having an end face which engages liquid in the cylinder and which is formed with a central recess which generates a sound pressure wave upon impact of said end face with the liquid;
- (c) power operated means for reciprocating said piston in said cylinder;
- (d) a metallic tube connected to one end of said cylinder and extending through the ground formation to said underground level; and
- (e) pumping mechanism at said underground level comprising:
 - 1. a lower cylinder having its upper end connected to said tube and having a lower end wall formed with a passage communicating with liquid in said lower level,

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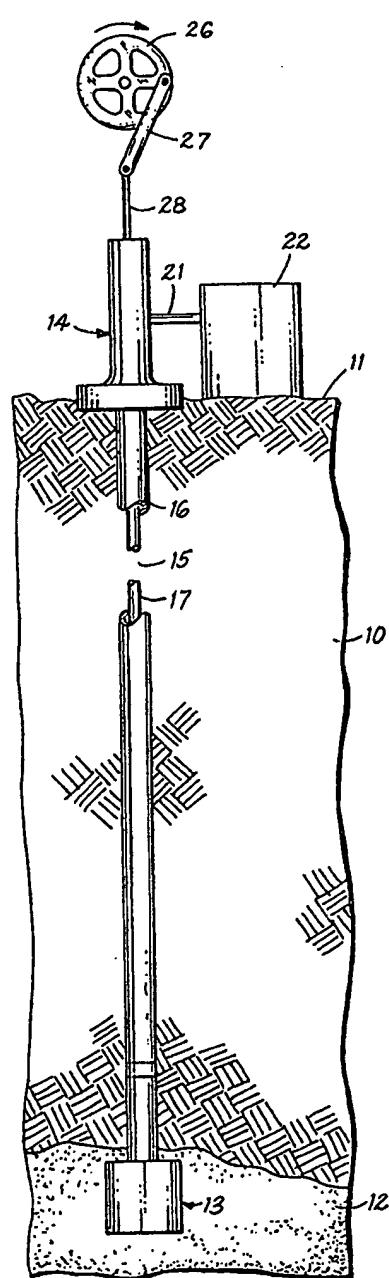
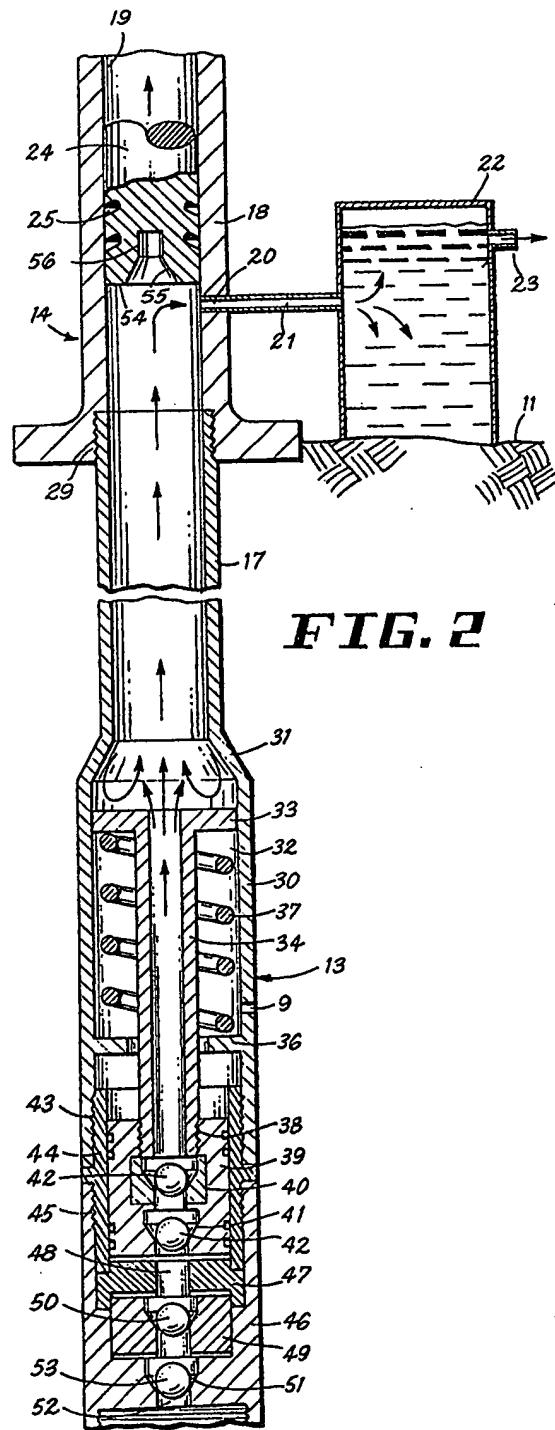
The present invention relates to a surface operated single tube pump and is concerned primarily with such a pump which includes underground pumping mechanism which is operated by sound pressure waves generated at the ground 5 surface.

At the present time it is known to provide pumping mechanism at the underground level of liquid to be pumped and which mechanism is operated by impulses on liquid in a tube which extends from the underground pumping mechanism 10 to the ground surface, the impulses being created at the ground surface. This known mechanism includes a plunger having a central passage extending therethrough and which reciprocates in a cylinder. The plunger is biased upwardly with respect to the cylinder by one or more springs. These 15 springs are compressed by the downward component of a pulse and energy is stored therein. Hence upon relief or upward component of the pulse, the springs move the plunger upwardly which results in upward movement of the column of liquid. Thus it may be stated as a general rule that in known single 20 tube surface operated pumps the liquid to be pumped is moved upwardly by spring pressure generated by pulses imparted to liquid in the tube.

While sound waves travel through air under normal atmospheric pressure at the rate of 1100 feet per second, 25 it is a well recognized phenomenon that sound waves will travel at a much higher rate through liquid or about a liquid which is encased in a metal tube. Thus, by way of example, it is noted that in oil which is encased in a metal tube, sound waves will travel at a rate of 5,000 feet per second. 30 It is also a phenomenon which may not be so well recognized that a sound pressure wave is created by the impact of the

ABSTRACT OF THE DISCLOSURE

A single tube surface operated pump is provided here: including a piston reciprocally mounted in a cylinder for alternately opening and closing a lateral fluid delivery port and for generating a sonic pressure wave by impacting a column of fluid in a metallic tube extending from the cylinder to a remote pumping mechanism located in communication with the fluid to be pumped. The piston is especially configured with a central recess in the face thereof so that the sonic pressure waves generated thereby will move toward the pumping mechanism in a spiral-like motion against the inner wall of the metallic tube and are reflected off of the pumping mechanism into a central column which travels back toward the cylinder and causes the fluid to be pumped to move in that same direction. Thus, by broad aspects of this invention, the sound pressure wave is generated by the impact of the end face of the aforesaid piston having the specially shaped recess or depression therein with the liquid. Such generated pressure wave is used to move a column of liquid upwardly to the ground surface from an underground level.

**FIG. 1****FIG. 2**

Patient figures